

**Statement**  
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**Before the**  
**Subcommittee on Forests and Forest Health**  
**House Resource Committee**  
**U.S. House of Representatives**

**Developing Biomass Potential: Turning Hazardous Fuels**  
**into Valuable Products.**

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Mr. Chairman,

Thank you for the opportunity to meet with your committee today. I am Dr. Chris Risbrudt, Director of the USDA Forest Service's Forest Products Laboratory in Madison, Wisconsin. The Lab specializes in finding new and improved uses for wood. You have asked me to speak about Developing Biomass Potential: Turning Hazardous Fuels into Valuable Products.

The Healthy Forests Restoration Act (HFRA) signed into law last December by President Bush marks a clear and decisive change in direction to address the causes of catastrophic wildfires and insect and disease infestations, by implementing hazardous fuel reduction projects in priority areas. This is a laudable and necessary goal.

I know you, Mr. Chairman, and the subcommittee members recognize the scope of the threat to our forests and communities. The authorities in HFRA will help us accomplish our mission, but one potential hurdle is the marketability of the millions of tons of woody biomass we will need to remove from these landscapes. The lack of markets will lead to continued outlays of funds to remove material, and then to dispose of it. We are here today to tell you about the new processes and products Forest Service researchers have been developing that will help overcome this hurdle.

Before talking about that, I will try to take the acres, condition classes and stand densities that have been the focus of the Congressional debate regarding HFRA and translate them into volumes of biomass and timber to give you a greater appreciation of the immense stream of woody materials that will need to be disposed of after necessary thinning operations have taken place.

The April 2003 report entitled “A Strategic Assessment of Forest Biomass and Fuel Reduction Treatments in Western States” that was a joint effort involving a team of Forest Service researchers in cooperation with the Western Forestry Leadership Coalition is a good source. Let me state that healthy forests is not solely an issue for the West, but one for our entire country. But for purposes of this testimony today, I am concentrating somewhat on the West where our greatest challenges lie.

The objective of the assessment was to characterize on a regional scale the amount of forest biomass that could potentially be removed to implement the fuel reduction and ecosystem restoration objectives of the National Fire Plan for the Western United States. The assessment covers forests on both public and private ownerships and describes all standing tree volume including stems, limbs, and tops. The assessment includes analysis of treatment areas and potential removals, as well as the operational systems necessary to effect the treatments, the potential environmental impacts, and utilization opportunities for removed material.

First, the assessment found the 15 western states encompass almost 1 billion acres of land, of which 236 million acres are forested. Slightly more than half of the forested area (130 million acres) is classified as timberland according to the standard definition (i.e., capable of growing at least 20 cubic feet per acre per year and not reserved by law or administrative action from timber harvest). This acreage was further refined by Fire Regime Condition Class—which is a measure of how much a forest has departed from natural wild land fire conditions.

The scientists then estimated current forest conditions for areas needing hazardous fuel reduction treatments based on the combination of Forest Inventory and Analysis (FIA) data and a well accepted coarse-scale fire regime assessment. Plot data from 37,000 permanent FIA field plots were summarized by forest type and ecoregion. Computer modeling then applied selective removal prescriptions to that inventory using Stand Density Index (SDI) criteria. SDI is a long-established, science-based forest stocking guide that can be adapted to uneven-aged forests using data available from broad-scale inventories. This approach allowed for prescriptions across a wide range of ecosystems to reduce stand density to a healthy condition, determined in the assessment to be 30 percent of maximum SDI for any given stand. Trees assumed to be removed generally were small to mid-size trees. However, larger trees could also be removed if needed to reach an overall healthy condition for the forest and provide for regeneration of desired species.

***This is important.*** While removal of sub-merchantable seedlings and saplings is important to reduce ladder fuels, there is ample research that indicates that there is a range of stand condition where thinning only small material does little to reduce crown fire spread. There is also research indicating that a comprehensive treatment, that is, one that removes some trees from all diameter classes, has a more significant effect on reducing fire risk than removing only small trees in many stand conditions. It also greatly improves the regeneration of desired species and reduces treatment costs to taxpayers.

The assessment excluded reserved forests and low-productivity forests and made reductions for operational limitations such as steep slopes, and sensitive sites. According to a global analysis, about 60 percent of the North American temperate forest is considered accessible (not reserved or high elevation and within 15 miles of major transportation infrastructure). A survey of National Forest land and resource management plans from 1995 also found that about 60 percent of the western National Forest *timberland base* is considered "suitable" for timber production operations (this is only 37 percent of the forestland base). The determination of "suitable" indicates that current forest operations technology would not produce irreversible damage to soil or water resources.

Applying the selective removal prescriptions to the identified inventory across the West, the assessment projected that the vast majority (86%) of the trees that could be removed would be less than 10 inches in diameter. There are nearly 2 billion trees in the 2-inch diameter class alone. While most of the trees that could be removed would be less than 10 inches, most of the associated volume would come from the 14 percent of the trees that are greater than 9 inches in diameter. In fact, under the assessment's projections, half of the volume would come from trees greater than 13 inches in diameter.

The assessment provides several scenarios of the merchantable wood and biomass that could be produced. I will limit this discussion to two: under one scenario, needed mechanical treatments done on 60 % of Fire Regime Condition Class III lands would result in West wide annual removals over 30 years of: 8 million bone dry tons (bdt) of merchantable wood and 3.4 million bdt of non merchantable wood, for a total of 11.4 million bdt. The other scenario is where treatments would be done on 60% of both Condition Class II and III lands. That could be project to result in West wide annual removals over 30 years of 21 million bdt of merchantable wood and 8.7 million bdt of non merchantable wood, for a total of 30 million bdt.

Put those figures into context. In 1999, the western forest industry processed about 28 million bdt of roundwood for lumber and 2.2 million bdt for pulpwood. Of the portion going to lumber mills, more than half the volume went as residues to pulp and particleboard mills. Current estimates indicate 32 million bdt of annual growing stock removals in the West are currently going to all products including medium-density fiberboard (MDF) plants, particle board plants, pulpwood and hog fuel. The scenario above involving only Condition Class III lands could represent about 36% of the current level of annual harvest in Western States (32 million bdt). Treatments of condition class II and III lands results in removals that are about 94% of the current level of annual harvest in Western States. Volume from thinning treatments could either replace current sources of raw material within the existing manufacturing infrastructure; or it could require private sector investment in new facilities.

The market price impacts from the fuels reduction program could range from practically nothing to very large. For example, a program that mechanically reduces fuels on Condition Class II and III forestlands and that simply added to current harvests could result in total region harvests of more than 60 million bdt and large aggregate price

reductions. Price reductions arising from such a program might also negatively impact non-participating forestland owners through lower timber prices. A program that only addressed fuels on the Condition Class III lands but that replaced 8 million bdt of existing harvests would have much less aggregate price impact, although some local effects could be experienced.

The potential size of the manufacturing infrastructure needed to process material from fuel reduction treatments is large. Whether there would be expansion at existing facilities, restarted mills, or new construction would depend on many factors.

The economics of establishing a large number of processing facilities is highly uncertain. Attracting investment to new processing infrastructure involves analysis of long-term supply and market forecasts. Today's forest products markets are global and western production will have to compete with material from other wood producing regions. There are considerable challenges associated with establishing new processing plants in the West that go well beyond implementation of the fuel reduction treatments.

A complete analysis of the market effects as well as program costs will be conducted under a separate Joint Fire Science Program study, "A national study of the economic impacts of biomass removals to mitigate wildfire damages on federal, state, and private lands." This study seeks to evaluate market price and other economic effects of alternative scales of fuel reduction programs, with emphasis on Wildland-Urban-Interface zones. The study will also evaluate the differential effects of fuel reduction harvests that produce merchantable materials that substitute for or add to existing regional harvests.

So there is a challenge to find, grow or create markets and facility infrastructure sufficient to accommodate this volume of materials, much of which will come from small-diameter material for which there is not substantial market opportunities.

Congress did not ignore that pressing need in HFRA. Title II of the law provides authority to obtain information that will help overcome barriers to the production and use of biomass and help communities and businesses create economic opportunity. Three programs will help achieve these goals.

Section 201 of HFRA amends the Biomass Research and Development Act of 2000 to authorize research focus on overcoming barriers to the use of small diameter biomass. Many of the more than 120 proposals now being considered for funding under that Act by the Department of Agriculture and the Department of Energy relate to forestry and small diameter material. In all, some \$22 million will be available this year. Forest Service Research and Development also has a comprehensive research program in the major areas of forest biomass assessment, management, harvesting, utilization, processing, and marketing.

Section 202 of HFRA, Rural Revitalization through Forestry, is aimed at helping communities and businesses create economic opportunity through the sustainable use of the nation's forest resources. While the key to this will be the actions of the private

sector, the likelihood of success can be increased through the participation of State Foresters; Forest Service Technology Marketing specialists, such as at the Forest Products Lab; and federal and state economic development assistance agencies in collective efforts with local non-profit and for-profit businesses to build community-based forest enterprises. On-going efforts of the unit at the lab and S&PF resource specialists across the country provide this support.

Section 203 of HFRA authorizes grants to persons who own or operate a facility that uses biomass as a raw material for specific processes and products. The Forest Service has authority to provide grants for businesses, units of state and local government, non-governmental organizations (NGOs), and other entities with legal status. This Title expands authority to persons owning or operating facilities that use biomass as a raw material in producing energy, sensible heat, transportation fuels, and biobased products. Grants are limited to costs related to the purchase of biomass.

There are a number of efforts throughout the Forest Service, many being conducted jointly by R&D and State & Private Forestry that focus on three key areas for using large volumes of biomass: pulp and paper, energy and fuel, and engineered wood products and composites.

This hearing is focused on the third area. While I will discuss those programs at the Forest Products Laboratory which I know best, there are other important programs for forest products utilization in Forest Service Research and Development and State and Private Forestry which could focus on underutilized biomass.

The performance of new composite materials is determined primarily by the properties of the wood particles, the polymer binder, and the interfacial region that is established between the two distinct phases. Forest Service research at Pineville, LA, is exploring the relationship between wood surface properties and interfacial characteristics, and addressing thermosetting and thermoplastic polymer systems to develop superior wood-based composite products.

Forest Service researchers in Blacksburg, VA, are developing and using expert systems and vision systems to support computer-aided and automated hardwood sawmill edging and trimming; developing a scanner/computer system to identify defects on rough lumber; supporting the development of a prototype vision system to automatically grade and upgrade rough lumber; developing products or better processes to improve the use of low-grade and small diameter hardwoods; and developing and evaluate automated production systems to grade pallet parts.

In Portland, OR, the program characterizes the forest resources and evaluates their uses by assessing the technical feasibility of producing primary and value-added wood products through empirical studies and simulation of western species. Projects such as establishing a database of western hemlock wood product recovery and lumber recovery from young-growth western hemlock and sitka spruce in Alaska are the types of biomass work done by this program

The use of small diameter ponderosa pine that results from fuel reduction treatments is the focus of research in Flagstaff, AZ. This project is assessing the economic costs and benefits associated with different harvesting practices and regionally based utilization opportunities in fuel reduction treatments. This information will provide Federal land managers, contractors, and the public with an assessment of whether treatments can meet fuels reduction objectives at lower costs.

At the Forest Products Laboratory, we are working on a number of innovative engineered wood and composite products that could penetrate our nation's huge home building market.

For instance, this I-Beam, similar to those used extensively to support the floors in your home, is made out of tiny glulam beams sandwiched around a piece of oriented strandboard, or OSB. If you are not familiar with OSB, it is now used more commonly than plywood to sheath the homes in this country. Glulam beams are the large beams you'll find in many homes supporting the roof. Picture this one I'm holding here, only about 100 times larger.

The great thing about engineered wood products is that they can be made with virtually any fiber, including small-diameter timber. Builders love them because they are engineered and designed for a particular use. Because they are comprised of small pieces of fibers, they do not have knots and other flaws commonly found in solid wood. The strength in them is much more consistent. And they are much less likely to twist, bend, or warp.

Composites are another growth market that we are *very* excited about. Take a look at this shingle. It is made from recycled milk jugs and juniper. For those of you from the Southwest, you know some areas have an overabundance of juniper. It has taken over the landscape, crowding out other vital species and voraciously soaking up precious water. There is not much of a market for juniper...until now.

These shingles, which can be molded to look like Spanish tiles, cedar shakes, or whatever else you'd like, are just one example. They have a "class A" fire rating and an expected service life of 40 years. We are also working with a company in Ruidoso, New Mexico to make signs out of juniper and plastic, such as this one that you might see on one of our National Forests. One of the biggest problems we've had with our signs is that porcupines love to eat them. However, they don't have an appetite for these. And they are much more resistant to a vandal's bullet than the old wooden ones. Although it sounds funny, these signs have proven to be very successful, and the little company in Ruidoso is now employing over 20 people, with plans to expand into other areas.

Another great idea our researchers have come up with is filtering contaminants from water with juniper. Filtering water is big business. These filters are very cheap to make, and very effective at removing contaminants such as acid mine waste, oils, pesticides, and agricultural and parking lot run-off. We also think they have great potential as

erosion control mats. And you can use a variety of fibers. One possibility is using the slash from thinnings or the debris left after a fire to make erosion control mats to stabilize an area.

Energy is another high volume usage area. We are currently working with the DOE's National Renewable Energy Laboratory on a nationwide demonstration project using portable distributed energy systems. Distributed energy systems are decentralized energy production systems capable of grid connection. Basically, picture a large portable generator that you take with you to the woods, rather than bringing the woods to the generator.

The largest of the systems we will be demonstrating is 50 Kw in size, or about enough power to run about 10 residential homes. We feel that the results of these demonstration projects will then allow us to create a one-megawatt unit. A one-megawatt system would use about 12,000 tons of wood per year and produce enough electricity to power about 200 homes. And similar to what we've stated before, if you burn the unusable logs for power, sell the merchantable logs, and sell the power to the grid, you can actually make a profit while doing forest thinning. Other Forest Service research stations are developing management systems to ensure efficient and effective treatments; product development, utilization, and evaluation; and sustainability of the wood and bioenergy resource.

I could go on and on about our products, but I've got a lot of other people who are patiently waiting to tell their story. I'd like to invite everyone from this committee to come out to the Forest Products Laboratory to see what we're working on. Congressman Peterson, made the trip to Madison during one of our entrepreneur tours, and I think he was excited about what he saw.

For the past several months we have jointly hosted with Evergreen Magazine a series of tours for small business owners throughout the West to show them some of our small-diameter utilization technologies.

There are numerous specialty markets for small-diameter material such as post-and-rail, rustic furniture, firewood, animal bedding, and composts. Many of the witnesses today have success stories to share with you in these markets. We see opportunities both for large, volume driven businesses and for small, niche market driven businesses. Both sides will play a part in helping us solve the small-diameter problem.

Many people who would like to start a small forestry based business of some sort are doing it for the first time. They do not have the experience to pull things together like a business plan that will allow them to go to a bank and get a loan. That is where the Forest Service can help. We can help them decide what business makes sense for their given resources and market, and outline a specific course of action. Efforts like these are the key to restoring that lost infrastructure we talked about earlier.

Thank you, Mr. Chairman and committee members, for your time. I would be pleased to answer any questions you have about the assessment or our programs at the Forest Products Laboratory.